

River Landing, La., 44.9 feet; at Baton Rouge, La., 34.8 feet, and at New Orleans, 15.9 feet and falling.

The Signal Service observer at Memphis, Tenn., reports that the changes in the stage of the water at Cairo, Ill., were felt at Memphis in about sixty hours, a rise of 2.35 feet at Cairo being followed by a rise of 1.0 foot at Memphis. The Signal Service observer at Vicksburg, Miss., reports that, excluding Austin crevasse, the crevasses on the Mississippi side flooded the greater part of Washington, Sharkey, and Issaquena counties, and portions of Bolivar and Sunflower counties, and that, while the damage to property and stock was very great, no estimate of the losses could be formed at the close of the month. The Signal Service observer at New Orleans, La., reports that the damage from the Nita crevasse was great. The Mississippi Valley Railroad property at that point was submerged, and great damage was done to the cane crop. About three-fourths of the water from the Nita crevasse found its way into Lake Pontchartrain through the passes at Manchac, one of which was about nine hundred feet and the other about twenty-four hundred feet wide, with an average depth in both of about ten feet. Most of the plantations suffering were those fronting on the river.

Along the Ohio River and its tributaries flood conditions prevailed throughout the month; houses, barns, etc., in low lying districts were washed away; railroad and river traffic was interrupted, and bottom lands were flooded, causing heavy losses and much suffering. At Cincinnati, Ohio, the river rose very rapidly to a maximum height of 59.2 feet from 11 p. m. of the 25th to 4 a. m. of the 26th, the highest point reached since February, 1884, when the stage of the water was 71 feet.

At the close of the month the outlook in the lower Mississippi valley was discouraging. In addition to the danger and damage feared from water, the stock left in the valleys were being tortured by the regular attendant of high water, the Buffalo gnat. The Ohio and Mississippi rivers were generally falling, except at Cairo, Ill., where the river was rising, and at New Orleans, La., where the river was stationary. The water was 1.6 foot above the danger-line at Cincinnati, Ohio; 7.7 feet above at Louisville, Ky.; 6.6 above at Paducah, Ky.; 8.1 above at Cairo, Ill.; 0.4 above at Memphis, Tenn.; 10.6 above at Helena, Ark.; 5.3 above at Vicksburg, Miss.; and 2.9 above at New Orleans, La.

#### OPENING OF NAVIGATION.

**Lake Ontario.**—A schooner arrived at Oswego, N. Y., on the 24th; this was the first arrival of the season at that port.

**Lake Erie.**—A steamer left Toledo, Ohio, for Erie, Pa., on the 24th; this was the first departure of the season from Toledo. Several vessels left Sandusky, Ohio, on the 17th, opening navigation at that port for the season. A steamer left Cleveland, Ohio, for Detroit, Mich., on the 3d; this was the first departure of the season from that port. A propeller arrived at Buffalo, N. Y., from Toledo, Ohio, on the 31st; this was the first arrival of the season at Buffalo.

**Lake Huron.**—A schooner arrived at Port Huron, Mich., from Alpena, Mich., on the 23d; this was one of the earliest

passages on record. Navigation between Port Huron and Detroit, Mich., began for the season on the 24th, when the steamer "Ossifrage" resumed her trips. A steamer on her way to Alpena, Mich., touched at Port Huron on the 30th, and navigation on Lake Huron was considered open for the season on that date.

**Connecticut River.**—On the 13th there was considerable floating ice in the river at New London, Conn., but steamers were making regular trips.

**Hudson River.**—On the 20th a steamer arrived at Albany, from New York City; this was the first arrival of the season at Albany; and the boats of the Schuyler Towing Company were on their way up the river with their first tow of the season.

**Thunder Bay and Thunder River.**—The river and bay froze over on the 5th, closing navigation until the 31st, when a steamer arrived at Alpena, Mich., from Detroit, Mich. The steamer left for northern ports on the same date.

**Mississippi River.**—A steamer arrived at La Crosse, Wis., on the 31st; this was the first arrival of the season at that port. On the 19th the ice in the river at Dubuque, Iowa, broke, opening navigation at that point.

#### STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during March, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, March, 1890 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<b>Red River:</b>						
Shreveport, La.....	29.9	22, 23, 24	28.0	1	21.4	6.6
<b>Arkansas River:</b>						
Fort Smith, Ark....	22.0	12	21.0	31	4.6	16.4
Little Rock, Ark....	23.0	14	22.3	11	9.6	12.7
<b>Missouri River:</b>						
St. Buford, N. Dak.*	21.0	22	9.3	1, 2	1.5	7.8
<b>Mississippi River:</b>						
Kansas City, Mo....	21.0	22	9.3	1, 2	1.5	7.8
Saint Paul, Minn....	14.5	28	3.0	13	1.8	1.2
La Crosse, Wis....	24.0	21	4.5	27	2.9	1.6
Dubuque, Iowa....	16.0	23, 24	4.5	31	3.6	0.9
Davenport, Iowa....	15.0	16	5.1	31	3.0	2.1
Keokuk, Iowa....	14.0	16	5.6	1	1.1	4.5
Saint Louis, Mo....	32.0	29	15.2	8	4.7	10.5
Cairo, Ill.....	40.0	12, 13	48.8	1	42.1	6.7
Memphis, Tenn....	34.0	14 to 17, 23 to 28	36.6	1	32.6	4.0
Vicksburg, Miss....	41.0	15, 16	48.0	1, 2, 3, 4, 31	46.3	1.7
New Orleans, La....	13.0	13	17.0	1, 2	15.5	1.5
<b>Ohio River:</b>						
Pittsburgh, Pa....	22.0	23	24.3	9	4.8	19.5
Parkersburg, W. Va.	38.0	25	35.0	10	8.4	26.6
Cincinnati, Ohio....	50.0	26	59.2	11	23.3	35.9
Louisville, Ky....	25.0	28	35.5	10	10.4	25.1
<b>Cumberland River:</b>						
Nashville, Tenn....	40.0	6	50.6	13	20.0	30.6
<b>Tennessee River:</b>						
Chattanooga, Tenn.	33.0	2	42.5	13	8.6	33.9
Knoxville, Tenn....	29.0	1	16.2	13	3.7	12.5
<b>Monongahela River:</b>						
Pittsburgh, Pa....	29.0	23	24.3	9	4.8	19.5
<b>Savannah River:</b>						
Augusta, Ga....	32.0	1	21.4	19, 20	8.0	13.4
<b>Willamette River:</b>						
Portland, Oregon....	15.0	9	9.0	1	0.3	8.7

\* Frozen.

#### ATMOSPHERIC ELECTRICITY.

##### AURORAS.

Fort Buford, N. Dak.: an aurora was first observed at 9.55 p. m., 15th. It consisted of a well-defined arch of a light gray color of about 2° in width which rose to about altitude 25°, and extended over about 80° of the horizon, between northwest and northeast. No material changes occurred from the time it was first observed until it suddenly disappeared about 10.30 p. m. The display reappeared about 11.08 p. m., with characteristics and colors as before described, and continued so until near midnight.

Saint Vincent, Minn.: a remarkably brilliant aurora, extending from northwest to northeast, was observed from 9.45

p. m. until midnight on the 13th. It first appeared as a pale, diffused, whitish light, but soon changed to an orange color; six well-defined streamers shot up to altitude about 40° above the northern horizon. The display was perfect, and was characterized by recurring fits of brilliancy. A faint aurora was observed from 9.30 to 11.15 p. m., 22d; it was of a pale yellow color, and rose to about 15° above the horizon, and extended from azimuth 160° to 195°. During the last stage of the display it changed to a dull diffused light, which suddenly faded away. Auroral lights were also observed at this place on the 12th and 16th.

Auroras were observed during the month as follows: 3d,

Lowville, N. Y., and Webster, S. Dak. 7th, Greenwood, Wis. 12th and 13th, Saint Vincent, Minn. 15th, Sheldon, Minn.; Fort Buford, N. Dak.; Queensbury, N. Y.; Scranton, S. Dak.; Manitowoc, Wis. 16th, Saint Vincent, Minn. 17th, Riley, Ill.; Cornish, Me.; Hanover, N. H.; Leech Farm, N. Dak. 18th, South Canisteo, N. Y. 19th, Glendive, Mont.; Eagle's Mere, Pa. 22d, Saint Vincent, Minn.

### ○ THUNDER-STORMS.

The more severe thunder-storms of the month are described under "Local storms". East of the Rocky Mountains thunder-storms were reported in the greatest number of states and territories, twenty-one, on the 22d; in twenty on the 21st, 27th, and 28th; in fifteen on the 20th; in thirteen on the 18th; in from six to twelve, inclusive, on the 6th, 10th, 11th, 12th, 19th, 24th, 25th, 26th, 30th, and 31st; and in from one to five, inclusive, on the 1st, 2d, 4th, 5th, 9th, 13th, 14th, 17th, 23d, and

29th. On the 3d, 7th, 8th, 15th, and 16th no thunder-storms were reported east of the Rocky Mountains.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, eighteen, in Texas; on thirteen dates in Alabama; on eleven dates in Arkansas and Illinois; on from five to ten dates in Florida, Georgia, Indiana, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia; and on from one to four, inclusive, in Connecticut, Indian Territory, Iowa, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, Rhode Island, South Dakota, West Virginia, and Wisconsin. In states and territories east of the Rocky Mountains other than those named, no thunder-storms were reported. The only states and territories west of the Rocky Mountains reporting thunder-storms were: California, 25th and 28th; Colorado, 30th; Utah, 23d and 29th; and Wyoming, 26th.

## MISCELLANEOUS PHENOMENA.

### ○ DROUGHT.

Long and damaging drought was reported in the lower Rio Grande Valley; stock perished from need of water; the Rio Grande River was the lowest ever known at Brownsville, Tex.

### ○ HALOS.

Solar or lunar halos were reported in New England and the middle Atlantic states on twenty-three dates; 83 per cent. of the halos were attended on the first day, 65 per cent. were followed on the second day, and 61 per cent. were followed on the third day by rain or snow. In the south Atlantic states halos were reported on twelve dates; 50 per cent. of the halos were attended on the first day, 50 per cent. were followed on the second day, and 42 per cent. were followed on the third day by rain or snow. In the Gulf States halos were reported on fourteen dates; 57 per cent. of the halos were attended on the first day, 43 per cent. were followed on the second day, and 50 per cent. were followed on the third day by rain. In the Lake region halos were reported on sixteen dates; 75 per cent. of the halos were attended on the first day, 38 per cent. were followed on the second day, and 44 per cent. were followed on the third day by rain or snow. In the Mississippi and Ohio valleys halos were reported on twenty-nine dates; 73 per cent. of the halos were attended on the first day, and 63 per cent. were followed on the second and third days by rain or snow. In the Missouri Valley halos were reported on eighteen dates; 61 per cent. of the halos were attended on the first day, 67 per cent. were followed on the second day, and 55 per cent. were followed on the third day by rain or snow. In the Rocky Mountain and plateau regions halos were reported on seventeen dates; 47 per cent. of the halos were attended on the first day, 53 per cent. were followed on the second day, and 60 per cent. were followed on the third day by rain or snow. On the Pacific coast halos were reported on nineteen dates; 68 per cent. of the halos were attended on the first day, 74 per cent. were followed on the second day, and 63 per cent. were followed on the third day by rain or snow. In New England and the middle Atlantic states 48 per cent. of the halos occurred in the eastern quadrants, and 52 per cent. in the western quadrants of low pressure storms. In the south Atlantic states 58 per cent. of the halos occurred in the eastern, and 42 per cent. in the western quadrants of low pressure storms. In the Gulf States 64 per cent. of the halos occurred in the eastern, and 36 per cent. in the western quadrants of low pressure storms. In the Lake region 40 per cent. of the halos occurred in the eastern, and 60 per cent. in the western quadrants of low pressure storms. In the Mississippi and Ohio Valleys 40 per cent. of the halos occurred in the eastern, and 60 per cent. in the western quadrants of low pressure storms. In the Missouri Valley 71 per cent. of the halos occurred in the eastern,

and 29 per cent. in the western quadrants of low pressure storms. In the Rocky Mountain and plateau regions 53 per cent. of the halos occurred in the eastern, and 47 per cent. in the western quadrants of low pressure storms. On the Pacific coast 33 per cent. of the halos occurred in the eastern, and 67 per cent. in the western quadrants of low pressure storms.

Unusually well-defined and brilliant solar halos and parhelia were noted on the 2d at University and Pontotoc, Miss., Brodnax and Shreveport, La., Carrollton, Ala., Fort Smith, Ark., Peekskill, N. Y., Fulton, Wis., and Gallatin, N. Dak.; on the 4th at Fort Adams, R. I., and on the 31st at New Haven, Conn. Remarkably bright lunar halos were reported at Lawrenceburgh, Tenn., on the 2d, and at Trenton, on the 3d. The remarkable and extensively observed solar halos of the 2d occurred with high barometer, unusually low temperature, and heavy frost in the west Gulf states and the Mississippi Valley. The barometer continued high over the Gulf States during the 3d, and a low pressure storm moved southeastward over the upper lake region. On the 4th and 5th rain fell in the Gulf States, attending the presence of an area of low pressure in the Rio Grande Valley, and the development of a low pressure storm over the Gulf States.

### ○ METEORS.

Brilliant meteors were reported as follows: 3d, Nashville, Tenn.; 20th, Greensborough, Ala.; 30th, Cedar Keys, Fla. Meteors were also reported as follows: 4th, Leicester, Mass.; 6th, Butlerville, Ind.; 9th, State College, Pa.; 12th and 13th, Barren Creek Springs, Md.; 14th, Monticello, Iowa; 15th, Villa City, Fla.; Beverly, N. J.; Oregon, Mo.; 22d, Weeping Water, Nebr.; 29th, Heppner, Oregon.

### ○ MIRAGE.

Mirage were observed during the month as follows: 1st, Clinton, Mich.; 5th, Woonsocket, S. Dak.; 10th, Hampton, Iowa; 11th, Webster, S. Dak.

### ○ PRAIRIE AND FOREST FIRES.

Prairie fires were reported at Lexington, Nebr., on the 23d; at Fort Sully, S. Dak., on the 23d, 24th, 25th, and 26th; at Fort Sill, Ind. T., on the 1st to 5th, 7th, 8th, 11th to 29th; at Fort Custer, Mont., on the 22d and 23d; in Kit Carson, Colo., on the 23d and 24th; in Rooks, Lincoln, Sedgwick, and Kingman counties, Kans., on the 23d and 24th; and forest fires were reported at Egg Harbor City, N. J., on the 27th.

### ○ SUN SPOTS.

Mr. C. E. Buzzell, Leaf River, Ill.: solar observations during the month were made as follows: 4th, a good sized group of spots came into view by rotation, in high north latitude 32° 33'; the group was surrounded by prominent faculae, and remained unchanged until the 8th, when it